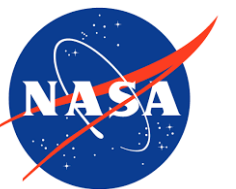


Hydrosphere Learning Progression



Grades 6-8: GLOBE Protocols Aligned with NASA and NGSS



NGSS Disciplinary Core Ideas Content Progression: Building on concepts developed in Grades K-2 and 3-5 associated with the properties of water, how it shapes the land and the distribution of freshwater and saltwater, Grades 6-8 will examine how water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Density variations of seawater drive interconnected ocean currents. Water movement causes weathering and erosion, changing landscape features. Complex interactions determine local weather patterns and influence climate, including the role of the ocean. Through a series of learning activities and GLOBE protocols, teachers can bring authentic science data collection into their classrooms.

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| Performance Expectations: MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. MS-PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. | | |
| Science Practices: Asking Questions and Defining Problems: <ul style="list-style-type: none"> Ask questions to identify and clarify evidence of an argument. Developing and Using Models <ul style="list-style-type: none"> Develop a model to describe unobservable mechanisms Develop and use a model to describe a phenomena Analyze and Interpreting Data: <ul style="list-style-type: none"> Analyze data to describe patterns in the natural world to answer scientific questions. | Disciplinary Core Idea: ESS2.C: The Roles of Water in Earth's Surface Processes <ul style="list-style-type: none"> Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. Global movements of water and its changes in form are propelled by sunlight and gravity. PS3.A: Definitions of Energy <ul style="list-style-type: none"> The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms molecules within a substance) and the transfer of that thermal energy from one object to another. science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule. The details of that relationship depend on the type of atom or molecul and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. ESS2.D: Weather and Climate <ul style="list-style-type: none"> Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regio geography, all of which can affect oceanic and atmospheric flow patterns. The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. | Crosscutting Concepts: Energy and Matter <ul style="list-style-type: none"> Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. Cause and Effect <ul style="list-style-type: none"> Cause and effect relationships may be used to predict phenomena in natural or designed systems. Systems and System Models <ul style="list-style-type: none"> Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. |
| GLOBE Application | | |
| Hydrosphere Protocols <ul style="list-style-type: none"> Water Temperature Water Transparency Dissolved Oxygen pH Atmosphere Protocols <ul style="list-style-type: none"> Clouds Precipitation Surface Temperature Water Vapor Pedosphere (Soil) <ul style="list-style-type: none"> Soil Moisture | GLOBE Data Sheets <ul style="list-style-type: none"> Hydrology Investigation Data Sheet Atmosphere Investigation Clouds 1-Day Data Sheet Daily Soil Moisture Data Sheet GLOBE Learning Activities: <ol style="list-style-type: none"> Land, Air and Water (MS-ESS2-4, MS-PA1-4) GC1: Your Regional to Global Connections (MS-ESS2-4) Modeling the Reasons for Seasonal Change (MS-ESS2-6) Seasonal Change on Land and Water (MS-ESS2-4, MS-PS1-4) | Guiding Question(s): <ul style="list-style-type: none"> How can satellite data be used to identify trends and patterns associated with various interactions that occur between the different Earth systems? How is water moved through the Earth system as a result of energy from the Sun? How does the unequal heating and rotation of the Earth affect oceanic circulation? |
| NASA Resources | | |
| Extension Learning Activities/Resources: <ul style="list-style-type: none"> NASA Climate Change Educational Modules NASA Earth Observatory World Maps NASA Wavelength 6-8 List of Learning Resource http://nasawavelength.org/list/2036 NASA Worldview | MY NASA DATA Live Access Server Data Visualization Tool: Earth System Data Explorer Parameter Suggestions: <ul style="list-style-type: none"> Daily Sea Surface Temperature (GHRST) Monthly Cloud Coverage (CERES) Monthly Precipitation (GPCP) Daily Soil Moisture (SMAP) | MY NASA DATA Lessons/Activities: <ul style="list-style-type: none"> Sea Surface Trends of the Gulf Stream Ocean Currents and Sea Surface Temperature A Comparison of Land and Water Temperature Comparing the Effects of El Nino/La Nino Hurricanes as Heat Engines The Reason for the Seasons |

Prepared by NASA Langley Research Center, Last Updated February 2018

